APPEAL BRIEF

BEFORE

BOARD OF PATENT APPEALS AND INTERFERENCES

IN THE

UNITED STATES PATENT & TRADEMARK OFFICE

In re:

U.S. Serial Number:	**09/351,147**
Filed:	**July 12, 1999**
Inventors:	**Arthur W. Chester et al**
Title:	**CATALYTIC PRODUCTION OF LIGHT OLEFINS FROM NAPTHA FEED**

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Applicant:		§	
	CHESTER, ET AL.	§	Confirmation No. 9325
Filed:	July 12, 1999	§	Art Unit: 1764
Serial No.:	09/351,147	§	Examiner: Walter D. Griffin
For:	Catalytic Production Of Light Olefins From Naphtha Feed	§	Docket No.: 10164-1

CERTIFICATE OF MAILING UNDER 37 CFR 1.8

I hereby certify that the attached correspondence is being deposited with the United States Postal Service in an envelope with sufficient postage as first class mail and addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on July 2, 2004 by:

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APPELLANTS' BRIEF UNDER 37 CFR 1.192(a)

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Sir:

Appellants appeal to the Honorable Board of Patent Appeals and Interferences the Primary Examiner's final rejection of the claims set forth in the Office Action of Examiner Griffin mailed December 4, 2003.

As required, the Appeal Brief is being filed in triplicate.

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1. Real Party in Interest

The real party in interest is ExxonMobil Corporation.

2. Related Appeals and Interferences

No appeals or interferences are known by Appellant, Appellants' legal representative, or assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

3. Status of Claims

Claims 1 to 3 and 5 to 10 are before the board for consideration.

4. Status of Amendments

Appellants have not filed any amendments after final.

5. Summary of the Invention

The present invention relates to a process for converting naphtha hydrocarbon feed over a catalyst comprising ZSM-5, ZSM-11 or combinations thereof treated with a phosphorus-containing compound, and a substantially inert matrix material, the catalyst containing less than 20 wt.% of active material and having an initial silica to alumina molar ratio between about 5 and about 30. The contacting is carried out under conditions sufficient to produce a product containing light olefins and aromatics.

The process can be used to provide increased yields of ethylene, propylene and high quality motor fuels containing aromatics from low value refinery, petrochemical or other chemical synthesis streams or other naphtha streams, especially in catalytic cracking reactors, e.g., conventional FCC units which ordinarily employ heavier feeds such as deep

cut gas oil, vacuum gas oil, thermal oil, residual oil, cycle stock, whole top crude, and the like. A key element of the present invention is its use of a catalyst comprising a zeolite which zeolite has been modified by treatment with a phosphorus compound, combined with a substantially inert matrix material. The catalyst comprises a zeolite component that is necessarily treated with a phosphorus compound.

6. Issues

Did the Examiner err in rejecting claims 1 to 3 and 5 to 10 under 35 USC 103(a) as being unpatentable over U.S. Patent No. 5,898,089 to Drake et al. (Drake) in view of EP 0323736 (EP '736)?

7. Grouping of Claims

Claims 1 to 3 and 5 to 10 stand rejected under 35 USC 35 USC 103 (a) as being unpatentable over U.S. Patent No. 5,898,089 to Drake et al. (Drake) in view of EP 0323736 (EP '736). Claims 1 to 3, 5 and 7 to 9 stand together.

Claim 6 stands rejected under 35 USC 103(a) as being unpatentable over U.S. Patent No. 5,898,089 to Drake et al. (Drake) in view of EP 0323736 (EP '736). Claim 6, which recites a hydrocarbon feed weight ratio, stands separately from the remaining claims, which are not so limited to a hydrocarbon feed weight ratio reaction parameter.

Claim 10 stands rejected as being unpatentable over U.S. Patent No. 5,898,089 to Drake et al. (Drake) in view of EP 0323736 (EP '736). Claim 10, which recites the amount of ethylene and propylene in the product, stands separately from the remaining claims, which are not so limited to a specific light olefins product.

8. Arguments

Claims 1 to 3 and 5 to 10 have been finally rejected under 35 USC 103 (a) as being unpatentable over U.S. Patent No. 5,898,089 to Drake et al. (Drake) in view of EP 0323736 (EP '736). In making this rejection, the Examiner argues that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Drake by utilizing the zeolite of the EP '736 reference because this zeolite can catalyze the desired reaction of Drake and therefore would be expected to be effective in the process of Drake. The Examiner also goes on to argue that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the process of Drake by utilizing a hydrocarbon feed weight ratio within the recited range of instant claim 6 and to optimize the process of Drake to produce the amount of ethylene and propylene, as recited in claim 10. Appellants respectfully disagree with the Examiner and request the Board to consider the following arguments.

Appellants respectfully submit that there is no *prima facie* case of obviousness, i.e., there is no suggestion to combine the teachings of Drake with those of the EP '736 reference. Further, if a *prima facie* case of obviousness has been established, which it has not, then Appellants have rebutted that case with evidence of unexpected results.

For purposes of appeal here, Appellants will direct attention to independent claim 1, which recites a catalyst having an initial silica to alumina molar ratio between about 5 and about 30. Drake, as noted by the Examiner at page 3, first full paragraph of the Final Rejection, lacks a teaching of the claimed initial silica/alumina ratio required by the

present claims. The EP '736 reference, relied upon by the Examiner to overcome Drake's shortcomings, teaches at page 5, lines 26 to 35, that a higher silica to alumina ratio would be preferable, but inasmuch as ZSM-5 may be difficult to prepare with the desired silica to alumina ratio, a silica to alumina ratio of 70:1 or less may be used. The silica to alumina ratio of the ZSM-5 catalyst used in Example 1 of EP'736 was about 50. Considering the teachings of the EP '736 reference that higher ratios are preferred, there is clearly no motivation to select a catalyst having an initial silica to alumina molar ratio from the much lower range between about 5 and about 30, as recited in claim 1.

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination. In re Geiger (CAFC 1987) 815 F2d 686, 2PQ2d 1276; In re Fine (CAFC 1988), 5 USPQ2d 1596.

Appellants submit that one skilled in the art would not substitute the EP '736 low Si/Al ZSM-5 zeolite component for the ZSM-5 component used in Drake's phosphorus-containing catalyst composite, inasmuch as EP '736 actually teaches *away* from the use of phosphorus-containing catalysts. The only teaching of this reference respecting phosphorus and catalyst relates to use of zeolites which can be *free* of oxides incorporated into the zeolites by an impregnation treatment. Thus, these zeolites can be free of oxides incorporated into the zeolites by an impregnation treatment. Examples of such impregnated oxides include oxides of phosphorus (page 3, lines 46-48).

Given the EP reference's teaching against the use of phosphorus-containing catalysts as noted above, it is highly unlikely that one skilled in the art would combine

this reference with Drake, given Drake's teaching to use a catalyst promoted with a wide variety of compounds including phosphorus containing compounds.

A careful review of Drake itself provides no incentive to that person skilled in the art seeking to improve olefins and aromatics selectivity, to utilize phosphorus-containing catalyst compositions. Drake at column 4, lines 56 to 62 teaches the addition of phosphorus solely for the purpose of "reducing coke deposition on a metal oxide-promoted zeolite, as compared to the use of the metal oxide-promoted zeolite only." Indeed, Drake actually teaches *away* from the present invention. Drake's Example II's results set out in Table II show a *reduction* in total light olefins and aromatics yield when phosphorus-containing catalyst is employed, with Catalyst DD containing zinc alone yielding 60.1 wt% compared with phosphorus- and zinc-containing Catalysts EE and FF yielding 56.1 wt% and 43.5 wt%, respectively. Thus one skilled in the art seeking to improve light olefin and aromatics selectivity is actually led *away* from the present invention by Drake.

Even if it is assumed that a *prima facie* case of obviousness has been made by the Examiner, Appellants have presented comparative test data showing evidence of unexpected results on pages 18 and 19 of the instant specification. Catalysts B and C, both having a silica to alumina ratio of 26:1, were prepared in accordance with the present invention. Catalyst A, with a silica to alumina ratio of 450:1, was used for comparative purposes. Table 3 on page 19 of the present specification illustrates the yields of ethylene for Catalyst B were significantly greater than for Catalyst A. The yields of propylene, as well as toluene, xylene and ethylbenzene, were also greater for

Catalyst B than for Catalyst A. Moreover, the use of Catalyst B resulted in higher production of both ethylene and propylene, relative to Catalyst A, as covered, in particular, by instant claim 10 which recites ethylene plus propylene in an amount greater than about 25 wt.% based on total product.

The use of Catalyst C, without the addition of steam in the feed, also resulted in higher production of both ethylene and propylene, relative to Catalyst A. The ethylene production appears to be the result of catalytic conversion by both Catalyst B and Catalyst C, and not due to thermal cracking, since the amount of dry gas, (methane and ethane) was relatively low in both cases. Appellants have thus clearly shown a process that produces an unexpected result, thereby rebutting any prima facie case of obviousness made by the Examiner. See In re Kirsch, 498 F.2d 1389, 182 U.S.P.Q. 286 (C.C.P.A. 1974).

Even assuming, arguendo, it would have been obvious to use a catalyst having the preferred initial Si/Al molar ratio of EP '736 in the process of Drake, it would not have been obvious to use a catalyst having the non-preferred molar ratio. One of ordinary skill in the art would try to optimize the process of Drake, not make the process less effective. Even though the prior art could be modified, the art must have suggested the modification. The prior art must provide a reasonable expectation that the proposed modification will succeed. The suggestion and the expectation of success in the process must be found in the prior art, not in Appellants' disclosure. See In re Dow Chem., 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988).

In the Decision on Appeal mailed March 26, 2003, the Board stated "that the Examiner and Appellants should reconsider a possible rejection under 35 U.S.C. 103 of all the appealed claims as unpatentable over Drake in view of EP '736 and other prior art and that the Examiner and Appellants should fully explore whether it would have been obvious to one of ordinary skill in the art to use the ZSM-5 of EP'736 in Drake, arriving at a process encompassed by at least claim 1 of the present invention. The Board went on to say that the Examiner should consider the experimental data summarized on pages 18 and 19 of the instant specification as evidence of unobviousness.

It is important to note that the Board itself did not make a new grounds of rejection. The Board merely said to "explore" and "consider" a rejection based on Drake in view of EP' 736 of at least claim 1. Claim 1 that the Board previously considered has since been amended to include an initial silica to alumina molar ratio between about 5 and about 30. Appellants have complied and have clearly shown that claims 1 to 3 and 5 to 10 are obvious over Drake in view of EP '736.

There is no disclosure of a catalyst/hydrocarbon feed weight ratio in Drake, as recited in instant claim 6. The catalyst/hydrocarbon feed weight ratio is not recognized as a process parameter, let alone a result effective variable, by Drake and thus it would not have been obvious to optimize. When the prior art has not recognized the result effective capability of a particular invention parameter, no expectation would exist that optimizing that parameter would be successful. See In re Antonie, 559 F.2d 618, 195 U.S.P.Q. 6 (C.C.P.A. 1977).

There is no disclosure in Drake of light olefins in the product comprising ethylene and propylene in an amount greater than about 25 wt.% based on total product, as recited in instant claim 10. It is well settled that the Examples are the closest prior art. None of the Examples in Drake produce a light olefin product which comprises ethylene plus propylene in an amount greater than about 25 wt.% based on total product.

Example II of Drake illustrates the use of catalyst compositions described in Example 1 as catalysts in the conversion of hydrocarbons to olefins and BTX. Catalyst EE (2 wt% phosphorus) and Catalyst FF (4 wt% phosphorus) produced only 21 wt.% and 18.6 wt.% ethylene and propylene, respectively. The amount of ethylene and propylene produced using the catalyst compositions of Drake is well outside Appellants recited range of ethylene and propylene in an amount greater than about 25 wt%, found in claim 10.

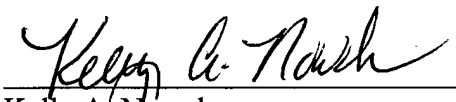
In conclusion, it is difficult, if not impossible, to imagine how one skilled in the art in possession of these references could conceive of the present invention absent hindsight reconstruction which was prohibited by the Supreme Court in Diamond Rubber Co. v. Consolidated Rubber Tire Co., 220 U.S. 428 435-436 (1911). It is well understood that the teaching of a reference *as a whole* should be considered. In *In re Wesslau*, 353 F.2d 238, 147 USPQ 391 (CCPA 1965), the court cautioned that "it is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." In *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416

(Fed. Cir. 1986), *cert. denied*, 484 U.S. 823 (1987), *on remand*, 10 USPQ2d 1929 (N.D. Calif. 1989), the Federal Circuit held that a single line in a prior art reference should not be taken out of context and relied upon with the benefit of hindsight to show obviousness. Rather, a reference should be considered as a whole, and portions arguing against or teaching away from the claimed invention must be considered.

Appellants respectfully submit that the foregoing arguments obviate all of the Examiner's final rejections in this case. The cited references neither disclose nor suggest the presently claimed invention. In view of this, reversal of these rejections by the Honorable Board is respectfully requested.

Respectfully submitted,

Date July 2, 2004



Kelly A. Nowak
Attorney for the Appellants
Registration No.35,620
(281) 834-0341 (Direct Line)

ExxonMobil Chemical Company
Law Technology
P. O. Box 2149
Baytown, Texas 77522-2149
(281) 834-2495 (Facsimile)

9. Appendix

1. A process for converting C_{4+} naphtha hydrocarbon feed to a product which includes light olefins and aromatics, comprising:
contacting said feed with a catalyst comprising ZSM-5, ZSM-11 or combinations thereof treated with a phosphorus-containing compound, and a substantially inert matrix material, wherein said catalyst contains less than 20 wt% of active matrix material and has an initial silica/alumina molar ratio between about 5 and about 30, said contacting being effected under conditions to produce a product containing light olefins and aromatics.

2. The process of Claim 1, wherein the C_{4+} naphtha hydrocarbon feed includes feeds having boiling point ranges from about 80°F (27°C) up to about 430°F (221°C).

3. The process of Claim 1 wherein the zeolite makes up about 5 to 75 wt.% of the catalyst, the substantially inert matrix material makes up about 25 to about 95 wt.% of the catalyst and phosphorus is present in amount of about 0.5 to 10 wt.% of the catalyst.

5. The process of Claim 1 wherein the substantially inert matrix material comprises silica, clay or mixtures thereof.

6. The process of Claim 1 wherein said conditions comprise a temperature of from about 950°F (510°C) up to about 1300°F (704.4°C), a hydrocarbon partial pressure from about 2 to about 115 psia (0.1 to about 8 bar), a catalyst/hydrocarbon feed weight ratio from about 0.01 to about 30, and a WHSV from about 1 to about 20 hr^{-1}.

7. The process of Claim 1 wherein the product comprises ethylene and propylene, with a $C_2 = / C_3 =$ wt. ratio greater than 0.39, and increased amounts of toluene and xylene relative to the hydrocarbon feed.

8. The process of Claim 1 further comprising co-feeding steam under conversion conditions in an amount from about 5 to about 30 wt% of the steam/feed mixture.

9. The process of Claim 1 wherein the product comprises ethylene and propylene, with a $C_2 = / C_3 =$ wt. ratio greater than 0.6, and increased amounts of toluene and xylene relative to the hydrocarbon feed.

10. The process of Claim 1 wherein the light olefins in the product comprise ethylene plus propylene in an amount greater than about 25 wt.% based on total product.